GROWTH AND INSTALLATION COST ANALYSIS OF SPRINKLER

SYSTEM IN JHUNJHUNU DISTRICT OF RAJASTHAN

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ABSTRACT

The data were analyzed by using compound growth rate model, simple tabular analysis, average percentage and ratio were calculated. The analysis of data revealed that the compound growth rate of number of sprinkler sets in Jhunjhunu district and Rajasthan was positive and highly significant. The growth rate of sprinkler system in Jhunjhunu district and in Rajasthan was 99.1 per cent and 98.6 per cent, respectively. The installation cost of sprinkler irrigation system was higher on the farmer's fields than the cost worked out by the state level unit cost committee. This difference is 18689, ` 18738, ` 15642 and 18612 on one, two, three and four hectare models of sprinkler system. The subsidy rate of the system was 40-50 per cent.

KEYWORDS: Growth, Cost and Sprinkler

INTRODUCTION

The vagaries of the monsoon render agriculture an uncertainty. The investment, on major and minor irrigation projects depends on monsoon rains. However, the available water for irrigation purpose has been continuously diminishing even India blessed with abundant water resources. About 69 million hectare metre(m.ha.m) of surface and 43.2 m.ha.m of ground water is available for use however, present utilization is approximately 60 m.ha.m for various purposes in the country. The use of water for irrigation constitutes about 84 percent of total utilization potential of water i.e.75 billion cubic metre. With the increase in demand of water for other uses, the share of water use for irrigation is likely to go down to about 73 percent by 2025.A.D.In a vast country like India with a geographical area of 328 million hectares, less than 45 percent of the area is cultivated. Out of total cultivated area only 65 million hectares (35 %) gets irrigation. Even after harnessing the entire potential of water resources, not more than 50 percent of cultivated land is irrigated (Anonymous, 2001).

The sprinkler method of irrigation saves water and can irrigate much more area than surface irrigation. It also eliminates channels and land leveling and more land is available for crop production. This method is particularly suited to the region because of sandy soils having high infiltration rate. The sprinkler system of irrigation being costly and most of the cultivators have only limited capital. Thus, it is essential to investigate cost and benefits of this method of irrigation

Sprinkler irrigation was first propagated in India during 1950s, but could not become popular due to availability of water in large quantity. In recent years, however, realization about the need for effective utilization of water, Sprinkler irrigation has started gaining ground. Sprinkler irrigation method distributes water to crops by spraying it over the crop area like a natural rainfall.

MATERIALS AND METHODS

The methodology used in the study is presented under three sub-heads viz., selection of sample, collection of data and analysis of data.

Sampling Framework - Multi-stage sampling technique was used for the selection of the sample farmers in the present study.

Selection of District -For the present study, Jhunjhunu district of Rajasthan was selected purposively because the Jhunjhunu district is one the major district using number of sprinkler system of the irrigation and also due to researchers' familiarity with the study area.

Selection of Tehsil- Jhunjhunu district comprises with six tehsil namely Chirawa, Udaipurwati, Nawalgarh, Jhunjhunu, Khetri and Buhana. Although among all these six tehsils number of sprinkler system were found highest in Chirawa tehsil. The total number of sprinkler system functioning in different tehsils of jhunjhunu district is given in table.

**Table 1: Number of Sprinkler Sets in Different Tehsils
of Jhunjhunu District (2012-2013)**

S. No.	Name of Tehsil	Total Sprinkler Sets (in Numbers)
1.	Chirawa	15,716
2.	Udaipurwati	11,725
3.	Nawalgarh	10,451
4.	Jhunjhunu	8,820
5.	Khetri	7,667
6.	Buhana	5,635
	Total	**60,014**

Source: Agriculture Directorate (Extension) Office, Jhunjhunu, Rajasthan

Growth Rates –To fulfil objective of studying growth of Sprinklers in Jhujhunu district, the growth rate equations were fitted and the compound growth rates (CGR) were used for the analysis. The following model of exponential trend was used to work out compound growth equations.

Exponential trend equation: $Y = AB^t U_t$

By taking logarithm of both sides, the equation takes the form:

Log Y = Log A + t Log B + Log U_t

By putting Log A = a, Log B = b and Log U_t = e, the equation becomes:

Log Y = a + bt +e

Where,

Y = Number of Sprinkler sets

t = Time

a = Constant

b = Regression coefficient

e = Error term

Compound growth rate = Antilog b-1

The student 't' test and 'R^2' value were used for testing the significance of compound growth rates.

Cost of Installation- To fulfil the objective of studying the cost of installation of Sprinkler irrigation system, officials of the Additional Director, Agril. Extension, Jhujhunu, agencies providing Sprinkler sets and selected beneficiaries were interviewed and required information recorded and analysed.

RESULTS AND DISCUSSIONS

Growth of Sprinklers- This section examines the growth of Sprinklers in Jhunjhunu district and its comparison with Rajasthan state as a whole to ascertain the status of Jhunjhunu in the state. Table 2 presents status of Sprinkler in Jhunjhunu district and Rajasthan state as a whole for a period from 2003-04 to 2012-13. The table reveals that the present share of Sprinkler of Jhunjhunu district in total number of Sprinkler in Rajasthan varied between 3.98 per cent to 8.13 per cent over the years. It was highest in 2008-09. Numbers of Sprinkler sets in Jhunjhunu district has been growing fast and during the period from 2003-04 to 2008-13, it has increased from 7918 to 33658, which is 5 times more from 2003-04. From the year 2009-10 to 2012-13, the share of sprinkler system in Jhunjhunu district was observed almost similar in 6 per cent. In Rajasthan state as a whole, the number of Sprinklers also increased from 198622 to 977147 during the period from 2003-04 to 2012-13, which is about 9 times more.

**Table 2: Total number of Sprinkler in Rajasthan and
Jhunjhunu during Year 2003-04 to 2012-13**

Years	Rajasthan	Jhunjhunu	Percent Share
2003-04	198622	7918	3.98
2004-05	207443	8742	4.21
2005-06	243817	10812	4.43
2006-07	298513	17300	5.79
2007-08	335785	22819	6.79
2008-09	413908	33658	8.13
2009-10	590880	36200	6.12
2010-11	710324	48014	6.75
2011-12	882537	56270	6.37
2012-13	977147	60014	6.14

Source: Directorate of Agriculture, Pant Krishi Bhawan, Jaipur (Rajasthan)

With a view to examine the nature of growth in number of Sprinkler sets compound growth rates have been worked out for Rajasthan and Jhunjhunu district and are presented in Table 3. The table reveals that the number of Sprinklers registered a growth of 99.1 percent per annum in Rajasthan and 98.6 percent per annum in Jhunjhunu. This revealed that both Rajasthan state and Jhunjhunu district has given much attention about sprinkler system of irrigation. It is evident from the results that for a period from 2003-04 to 2012-13, number of Sprinklers registered a higher growth in Rajasthan as compared to Jhunjhunu district. However, no major difference was observed in growth rate between

Rajasthan state and Jhunjhunu district. Both these growth rate were found significantly at 1 per cent level of significant.

Table 3: Compound Growth Rates of Number of Sprinkler Sets

Growth Rates	Rajasthan	R2	Jhunjhunu	R2
CGR	0.991*	0.982	0.986*	0.972

*Significant at 1% level of significance

Cost of Installation of Sprinkler System

In this section, an attempt has been made to present the details of cost of installation of Sprinkler system. To study this objective, information were collected by interviewing officials of the Additional Director, Agricultural Extension, Jhunjhunu and from selected beneficiaries. For presenting the results in systemic manner, this section has been divided into two parts:

- Cost of Sprinkler system

- Government's subsidy scheme.

Cost of Sprinkler System

The cost of Sprinkler system includes the cost of all components required for the system and depends upon location of the well, type of Sprinkler, discharge, land holding, cropping pattern, topography and the total head. State level unit cost committees finalize average unit costs for Sprinkler systems, which are also regularly revised. However, these may vary as per the actual site conditions. These costs are presented in the table 4.

Table 4 reveals that for one, two, three and four hectare models the cost of installation of Sprinkler system was ` 15565, ` 26681, ` 39171 and ` 49533, respectively and the pipe diameter recommended was 50 mm, 63 mm, 75 mm and 75 mm for one, two, three and four hectare model, respectively.

The costs of Sprinkler system on farmer's fields are presented in Table 4 which shows that farmers prefer the pipe diameter of 75 mm for all type of models. The real requirement of nozzles and riser pipes for one, two, three and four hectare model was 30, 39, 45 and 56, respectively, which greatly differed from the state level unit costs

Table 4: The Cost of Sprinkler System as Per the State Level unit Cost Committee (Cost in `)

S. No.	Item	1.0 ha (50 mm Diameter)			2.0 ha (63 mm Diameter)			3.0 ha (75 mm Diameter)			4.0 ha (75 mm Diameter)		
A		Qty.		Total Cost	Qty.	Unit Price	Total Cost	Qty.	Unit Price	Total Cost	Qty.	Unit Price	Total Cost
1	HDPE pipes with quick action coupler (2.0 to 2.5 kg/sq cm) of 6 meter long	26	410	10660	39	475	18525	44	590	25960	56	590	33040
2	Sprinkler coupler with foot batten assembly	2	240	480	7	240	1680	11	310	3410	14	310	4340
3	Sprinkler nozzles	5	370	1850	7	370	2590	11	370	4070	14	370	5180
4	Riser pipe 20 mm diameter x 75 cm long	5	100	500	7	100	700	11	100	1100	14	100	1400
5	Connecting nipple	1	220	220	1	265	265	1	345	345	1	345	345
6	Bend with coupler 90 degrees	1	160	160	1	160	160	1	250	250	1	250	250

	Table 4: Contd.,												
7	Tee with coupler	1	200	200	1	255	255	1	395	395	1	395	395
8	End plug	2	40	80	2	40	80	2	40	80	2	40	80
	Total System Cost			**14150**			**24255**			**35610**			**45030**
C	Transportation and Installation charges @ 10 percent	0.05		1415			2425.5			3561			4503
	Total Cost			**15565**			**26680.5**			**39171**			**49533**
	Rounded to			**15565**			**26681**			**39171**			**49533**

Table 5: The Cost of Installation of Sprinkler System on Farmers Fields in the Study Area (Cost in `)

S. No.	Item	1.0 ha (75 mm Diameter)			2.0 ha (75 mm Diameter)			3.0 ha (75 mm Diameter)			4.0 ha (75 mm Diameter)		
A		Qty.	Unit Price	Total Cost	Qty.	nit Price	Total Cost	Qty.	Unit Price	Total Cost	Qty.	nit Price	Total Cost
1	HDPE pipes with quick action coupler (2.0 to 2.5 kg/sq cm) of 6 meter long	30	590	17700	39	590	23010	45	590	26550	56	590	33040
2	Sprinkler coupler with foot batten assembly	2	310	620	7	310	2170	11	310	3410	14	310	4340
3	Sprinkler nozzles	25	370	9250	32	370	11840	40	370	14800	50	370	18500
4	Riser pipe 20 mm diameter x 75 cm long	25	100	2500	32	100	3200	40	100	4000	50	100	5000
5	Connecting nipple	1	345	345	1	345	345	1	345	345	1	345	345
6	Bend with coupler 90 degrees	1	250	250	1	250	250	1	250	250	1	250	250
7	Tee with coupler	1	395	395	1	395	395	1	395	395	1	395	395
8	End plug	2	40	80	2	40	80	2	40	80	2	40	80
	Total System Cost			**31140**			**41290**			**49830**			**61950**
C	Transportation and Installation charges @ 5 percent	0.05		3114			4129			4983			6195
	Total Cost			**34254**			**45419**			**54813**			**68145**
	Rounded to			**34254**			**45419**			**54813**			**68145**

Committee's recommendations Table reveals that the total cost of Sprinkler system on farmer's field for one, two, three and four hectare model was ` 34254, ` 45419, ` 54813 and ` 68145, respectively. This wide difference between total cost of Sprinkler system as per the state level unit cost committee's recommendations and on farmers field in the study area was due to erratic and less time of supply of electricity. In this situation farmer has to run their system with more number of nozzles per hectare at a same time, so they can irrigate more area in that limited time of electricity supply.

Government's subsidy scheme Government provided subsidy on installation of sprinkler system only for three types of sprinkler models and these models are 0.5, 1.0 and 2.0 ha to the farmers in 2012-13.

Government providing subsidy on Sprinkler system to motivate the farmers for adopting the system for saving the water. Government provides about 40-50 per cent of total estimated cost of Government body for different models as subsidy. The current subsidy scheme for different type of models has been presented in Table 6. The State Government has also provided a subsidy of 10 paisa/unit on electricity consumption to the farmers using Sprinkler/drip irrigation system to encourage sustainable use of underground water.

Table 6: Subsidy Provision for Different Models of Sprinkler System (2012-13)

For all Categories of Farmers (Gen./Small/Marginal/SC/ST/Women)		
S. No.	Sprinkler Model (ha)	Subsidy on Aluminium and HDPE Pipes (`)
1.	0.5	4582
2.	1.0	7894
3.	2.0	11299

Source: Additional Director, Extension, Jhujhunu, Rajasthan

CONCLUSIONS

The compound growth rate of number of Sprinkler sets during 2003-04 to 2012-13 in Jhunjhunu district and Rajasthan state as a whole was 98.6 and 99.1 per cent per annum, respectively. This indicates that Rajasthan state as well as Jhunjhunu district have a great potential in using the sprinkler irrigation systems. The cost of installation of Sprinkler irrigation system at farmer's field was found to be higher as against the same calculated by state level unit cost committee. It was due to irregular supply of electricity. Therefore, farmer using more nozzles and other accessories at a time to cover the more area during the electricity supply.

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